

REMARKS

Claims 1-49 are pending. Claims 34-49 were withdrawn in response to the Restriction Requirement of October 9, 2007. Claims 1 and 11 have been amended. Support for the amendments may be found throughout the specification (see, e.g., page 5, lines 22-24; page 8, line 30 to page 9, line 2; page 9, lines 20-22; and page 12, lines 12-20 of the specification).

Rejection under 35 U.S.C. § 102(b)

The Examiner rejected claims 1, 3-9, 11, 13, 15-19 and 21-33 under 35 U.S.C § 102(b) as being anticipated by U.S. Patent No. 5,547,748 to Ruoff et al. ("Ruoff") (see page 2 of the Office Action). Claims 1, 11, 21 and 27 and are independent. Claims 1 and 11 have been amended.

Claims 1, 3-9, 11, 13, and 15-19

Claim 1 relates to a composition including a particle including a core and a shell, the core including a metal carbide and the shell including a carbon nanoparticle chemically attached to at least a portion of a surface of the core.

Claim 11 relates to a composite abrasive particle including a core and a shell, the core including a metal carbide and the shell including a carbon nanoparticle chemically attached to at least a portion of a surface of the core.

Ruoff does not disclose a particle including a core including a metal carbide and a shell including a carbon nanoparticle chemically attached to the core. Ruoff says nothing about a carbon nanoparticle being chemically attached to the core. In Ruoff, the carbon shell encapsulates a metal carbide but is not attached to the metal carbide. Applicants' claimed core/shell structure including a carbon nanoparticle chemically attached to the core, results from growing the carbon nanoparticle through conversion of the metal carbide of the core (see, e.g., page 8, line 25 to page 9, line 8; page 9, lines 20-22; page 12, lines 12-20; and Examples 1-4 of the specification). Ruoff, on the other hand, does not describe obtaining the carbon shell through converting the metal carbide but through a carbon-arc process (see, e.g., Ruoff at column 4, lines 22-25; and Example 1). Applicants' specification states that:

A composite particle of carbon nanoparticles grafted to an underlying silicon carbide particle can be very wear-resistant and durable. The overall particle size of the carbon

nanoparticle or carbon nanoparticle-terminated abrasive particle is readily controlled, as it can be determined by the size of the starting SiC particle. Compared to other forms of carbon nanoparticles such as those made by arc discharge or laser ablation or chemical vapor deposition, the composite is much cheaper and has a higher packing density. It is more easily handled, and can be incorporated into grinding and finishing products at a higher volumetric density than is achievable with other forms of fullerenes.

See applicants' specification at page 12, lines 12-20. Thus, Ruoff does not disclose all elements of applicants' claims 1 and 11. Accordingly, claims 1, 11, and the claims which depend therefrom are not anticipated by Ruoff. Applicants respectfully request reconsideration and withdrawal of this rejection.

Claims 21-33

Claim 21 relates to a composition including a particle including substantially densely-packed carbon nanoparticles.

Claim 27 relates to an abrasive particle including substantially densely-packed carbon nanoparticles.

Ruoff says nothing about substantially densely-packed carbon nanoparticles. The Examiner argues that Ruoff describes substantially densely-packed carbon nanoparticles because "the core material fills or partially fills the innermost voids of the nanopolyhedra." Applicants respectfully disagree. While this statement indicates that the core material is present in the cavity of the nanoencapsulate, it says nothing about the packing density of the carbon shell. In fact, applicants' specification explains that carbon nanoparticles made by the process described in Ruoff result in lower packing density (see, e.g., page 5, lines 18-21 and page 12, lines 16-18 of the specification). Thus, Ruoff does not disclose all elements of applicants' claims 21 and 27. Accordingly, claims 21, 27, and the claims which depend therefrom are not anticipated by Ruoff. Applicants respectfully request reconsideration and withdrawal of this rejection.

Rejections under 35 U.S.C. § 103(a)

Ruoff in view of Ma

The Examiner rejected claims 2, 14 and 20 under 35 U.S.C. § 103(a) as being unpatentable over Ruoff in view of Ma et al., "Processing and properties of carbon nanotubes-

nano-SiC ceramic," *Journal of Materials Science* 1998, 33, 5243-5246 ("Ma") (see page 3 of the Office Action). Claims 2, 14 and 20 depend from independent claim 1.

Claim 1 relates to a composition including a particle including a core and a shell, the core including a metal carbide and the shell including a carbon nanoparticle chemically attached to at least a portion of a surface of the core.

As discussed above, Ruoff does not disclose a particle including a core including a metal carbide and a shell including a carbon nanoparticle chemically attached to the core. Ma does not remedy this defect. Ma does not disclose a particle including a core including a metal carbide and a shell including a carbon nanoparticle chemically attached to the core. Instead, Ma describes a hot-pressed composite of a mixture of silicon carbide and carbon nanotube powders (see Ma at paragraph 3.1, page 5243; and paragraph 3.4, page 5245). In Ma, the carbon nanotubes are dispersed throughout the silicon carbide powders (see Ma at paragraph 3.1, page 5243).

Thus, neither Ruoff, Ma, nor their combination teaches or suggests all the elements of claim 1. Accordingly, claims 2, 14 and 20 are patentable over Ruoff in view of Ma.

Ruoff

The Examiner rejected claims 10, 12 and 26 under 35 U.S.C § 103(a) as being unpatentable over Ruoff (see page 4 of the Office Action). Claims 10, 12 and 26 depend from independent claim 1 or 11.

As discussed above, Ruoff does not teach or suggest all elements of claim 1 or claim 11. Thus, Ruoff does not teach or suggest all elements of claims 10, 12 and 26. Accordingly claims 10, 12 and 26 are patentable over Ruoff. Applicants respectfully request reconsideration and withdrawal of this rejection.

Applicant : Yet-Ming Chiang et al.
Serial No. : 10/510,482
Filed : April 19, 2005
Page : 11 of 11

Attorney's Docket No.: 14952.0307 / MIT Case 8895

CONCLUSION

Applicants ask that the claims be examined. Should any fees be required by the present Reply, the Commissioner is hereby authorized to charge Deposit Account 19-4293.

Respectfully submitted,

Date: 3-21-08



Harold H. Fox
Reg. No. 41,498

Customer No.: 27890
STEPTOE & JOHNSON LLP
1330 Connecticut Avenue, NW
Washington, DC 20036-1795
Phone: 202-429-3000
Fax: 202-429-3902